



AMENDMENTS TO THE CLAIMS

1 1. (currently amended) Apparatus for detecting
2 relative movements of first and second parts at least
3 one of which is turnable relative to the other, compris-
4 ing:

5 at least one tracking device fixed relative to
6 said first part;

7 a helix non-rotatably associated with said second
8 part and having a plurality of convolutions including
9 first and second packages of neighboring convolutions,
10 each of said packages consisting at least in part of
11 abutting convolutions and said tracking device having
12 a portion extending between at least two of said convo-
13 lutions; and

14 means for turning said one part relative to said
15 other part.

2. (cancelled)

1 3. (original) The apparatus of claim 1, wherein
2 said means for rotating comprises means for rotating
3 said one part clockwise and counterclockwise.

1 4. (original) The apparatus of claim 1, wherein

2 said helix has a first axis and said second part has
3 a second axis intersecting said first axis within said
4 second part.

1 5. (original) The apparatus of claim 1, wherein
2 said helix has a first axis and said second part has
3 a second axis coinciding with said first axis.

1 6. (original) The apparatus of claim 1, wherein
2 said first part is coaxial with said second part.

1 7. (original) The apparatus of claim 1, wherein
2 said helix has first and second end convolutions, at
3 least one of said end convolutions being non-rotatably
4 secured to said second part.

1 8. (original) The apparatus of claim 1, wherein
2 said helix comprises first and second end convolutions
3 and an axis, and further comprising an axial abutment
4 provided on said second part to hold one of said end
5 convolutions against movement in the direction of said
6 axis.

1 9. (original) The apparatus of claim 1, wherein
2 said helix has an axis and two end convolutions, and

3 further comprising means for holding at least one of
4 said end convolutions against movement relative to said
5 second part at least substantially radially of said
6 axis.

1 10. (original) The apparatus of claim 1, wherein
2 said helix has an axis and said tracking device includes
3 at least one follower abutting at least one of said at
4 least two convolutions in at least one of a plurality
5 of directions including radially of and in the direction
6 of said axis.

1 11. (currently amended) The apparatus of claim
2 1, wherein said ~~convolutions--include--first--and--second~~
3 ~~packages--of--convolutions;--said first package including~~
4 includes one and said second package ~~including~~ includes
5 the other of said at least two convolutions.

12. (cancelled)

1 13. (original) The apparatus of claim 1, wherein
2 said helix includes a convoluted band.

1 14. (original) The apparatus of claim 1, wherein
2 said helix has an at least substantially polygonal

3 cross-sectional outline.

1 15. (original) The apparatus of claim 1, wherein
2 said convolutions have a common axis and said helix has
3 an at least substantially rectangular cross-sectional
4 outline.

1 16. (original) The apparatus of claim 15,
2 wherein said cross-sectional outline has a width and
3 a thickness as measured, respectively, radially of said
4 axis and in the direction of said axis, said width
5 exceeding said thickness.

1 17. (original) The apparatus of claim 16,
2 wherein said width is between about three and sixty
3 times said thickness.

1 18. (original) The apparatus of claim 1, wherein
2 said convolutions have a common axis and a thickness
3 less than 5 mm as measured in the direction of said
4 axis.

1 19. (original) The apparatus of claim 18,
2 wherein said thickness is less than 2 mm.

1 20. (original) The apparatus of claim 1, wherein
2 said helix, said device and said rotating means form
3 part of an axial drive, said helix having an outer
4 diameter and each of said convolutions having a width,
5 as measured radially of a common axis of said
6 convolutions, the ratio of said outer diameter to said
7 width being in the range of between about 100:1 and 1:1.

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1 21. (original) The apparatus of claim 20,
2 wherein said ratio is between about 30:1 and 5:1.

1 22. (original) The apparatus of claim 1, wherein
2 said parts, said helix, said device and said rotating
3 means form part of an axial drive, said helix having
4 an outer diameter and each of said convolutions having
5 a thickness as measured in the direction of a common
6 axis of said convolutions, the ratio of said outer
7 diameter to said thickness being in the range of
8 between about 700:1 and 25:1.

1 23. (original) The apparatus of claim 22,
2 wherein said ratio is between about 200:1 and 40:1.

1 24. (original) The apparatus of claim 1, wherein
2 the convolutions of said helix have one of a plurality

3 of cross-sectional outlines including a polygonal and
4 an at least substantially circular outline.

1 25. (original) The apparatus of claim 1, wherein
2 said helix consists of a resilient material.

1 26. (original) The apparatus of claim 25,
2 wherein said resilient material is selected from the
3 group consisting of spring steel, a plastic substance
4 and a ceramic substance.

1 27. (original) The apparatus of claim 1, wherein
2 said helix has between three and 300 convolutions.

1 28. (original) The apparatus of claim 27,
2 wherein the number of said convolutions is between about
3 five and fifty.

1 29. (original) The apparatus of claim 1, wherein
2 said helix and said tracking device cooperate to move
3 at least one of said first and second parts axially of
4 the other of said first and second parts in response
5 to rotation of said one part relative to said other
6 part.

1 30. (original) The apparatus of claim 1, wherein
2 said device is arranged to track said helix by
3 contacting successive increments of successive convolu-
4 tions of said plurality of convolutions in response to
5 rotation of said one part relative to said other part.

1 31. (original) The apparatus of claim 1, wherein
2 said rotating means includes means for rotating said
3 one part clockwise and counterclockwise, said device
4 including at least one first follower arranged to track
5 the convolutions of said helix in response to clockwise
6 rotation of said one part and at least one second
7 follower arranged to track the convolutions of said
8 helix in response to counterclockwise rotation of said
9 one part.

1 32. (original) The apparatus of claim 1, wherein
2 said device includes at least one first follower and
3 at least one second follower, said helix including a
4 portion disposed between said first and second follow-
5 ers.

1 33. (original) The apparatus of claim 1, wherein
2 said convolutions have a common axis and said device
3 includes at least one first follower and at least one

4 second follower spaced apart from said at least one
5 first follower as seen in the direction of said axis,
6 said helix having a portion disposed between said first
7 and second followers.

1 34. (original) The apparatus of claim 1, wherein
2 said convolutions have a common axis and said device
3 includes a plurality of followers including first and
4 second helix-contacting followers spaced apart from each
5 other in the direction of said axis, said helix being
6 in simultaneous contact with said first and second
7 followers.

1 35. (original) The apparatus of claim 1, wherein
2 said convolutions have a common axis and a predetermined
3 thickness as measured in the direction of said axis,
4 said device including first and second followers
5 arranged to track said helix and being spaced apart from
6 each other in the direction of said axis a distance at
7 least approximating said thickness.

1 36. (currently amended) The apparatus of claim
2 35, wherein said helix has a portion contacting said
3 followers and dividing said convolutions into ~~a~~ said
4 first package and ~~a~~ second package packages of neighbor-

5 ing convolutions, the number of convolutions in one of
6 said packages increasing and the number of convolutions
7 in the other of said packages decreasing in response
8 to rotation of said one part relative to said other
9 part.

1 37. (original) The apparatus of claim 1,
2 wherein said rotating means includes means for
3 selectively rotating said one part clockwise and
4 counterclockwise, said device including a first set of
5 followers tracking said helix in response to clockwise
6 rotation of said one part and a second set of followers
7 tracking said helix in response to counterclockwise ro-
8 tation of said one part.

1 38. (currently amended) The apparatus of claim
2 1, wherein said convolutions have a common axis and said
3 device includes a plurality of substantially pin-shaped
4 followers spaced apart from ~~eeh~~ each other in the direc-
5 tion of said axis and circumferentially of said helix.

1 39. (original) The apparatus of claim 38, whe-
2 rein said device comprises between three and twelve fol-
3 lowers.

1 40. (original) The apparatus of claim 1, wherein
2 said convolutions have a common axis and said device
3 includes a plurality of followers carried by said first
4 part and extending across the width of said at least
5 two convolutions as seen radially of said axis.

1 41. (original) The apparatus of claim 1,
2 wherein said device comprises at least one follower in-
3 cluding a bearing contacting at least one of said at
4 least two convolutions.

1 42. (original) The apparatus of claim 41,
2 wherein said bearing is one of bearings including
3 friction bearings and roller bearings.

1 43. (original) The apparatus of claim 1,
2 wherein said device includes at least one pin-shaped
3 follower rotatably mounted in said first part.

1 44. (original) The apparatus of claim 1,
2 wherein said device includes at least one substantially
3 pin-shaped follower arranged to engage at least one of
4 said at least two convolutions and at least one bearing
5 rotatably mounting said at least one follower in said
6 first part.

1 45. (original) The apparatus of claim 1,
2 wherein one of said parts is at least partially sur-
3 rounded by the other of said parts.

1 46. (original) The apparatus of claim 1,
2 wherein said second part is surrounded by said first
3 part.

1 47. (original) The apparatus of claim 1,
2 wherein said helix is at least partially surrounded by
3 one of said parts and a least partially surrounds the
4 other of said parts.

1 48. (original) The apparatus of claim 1,
2 wherein said device comprises at least one ramp provided
3 in said first part and extending circumferentially of
4 said helix.

1 49. (original) The apparatus of claim 48,
2 wherein said at least one ramp has a recess for a
3 portion of said helix.

1 50. (original) The apparatus of claim 48,
2 wherein said helix has a first lead and said at least
3 one ramp has a second lead at least approximating said
4 first lead.

1 51. (original) The apparatus of claim 1,
2 wherein said second part has at least one segment-shaped
3 or circumferentially complete thread-shaped recess, said
4 at least one tracking device comprising a plurality of
5 rolling elements disposed in said recess and said recess
6 having an end portion at which said rolling elements
7 are introduced into a starting point of said thread-
8 shaped recess.

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1 52. (original) The apparatus of claim 51,
2 wherein said thread-shaped recess further comprises a
3 starting portion and said rolling elements are guided,
4 in the region of transition from the starting and end
5 portions, into a path extending radially outwardly of
6 the radius of said spiral.

1 53. (original) The apparatus of claim 51,
2 wherein the paths of said helix and said recess cross
3 each other.

1 54. (original) The apparatus of claim 51,
2 wherein at least one of said rolling elements is barrel-
3 shaped.

1 55. (original) The apparatus of claim 51,
2 wherein said rolling elements have peripheral surfaces
3 in rolling contact with one of said helix and a surface
4 surrounding said recess.

1 56. (original) The apparatus of claim 1,
2 wherein said first and second parts have a common axis,
3 and further comprising means for biasing said parts
4 axially against each other.

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1 57. (original) The apparatus of claim 1,
2 further comprising means for biasing said parts in the
3 direction of action of the apparatus.

1 58. (original) The apparatus of claim 1,
2 wherein said parts have a common axis, and further com-
3 prising energy storing means arranged to bias said parts
4 in at least one of the directions including axially and
5 radially of said axis, said parts being prestressed
6 counter to the direction of bias of said energy storing
7 means.

1 59. (original) The apparatus of claim 1,
2 further comprising energy storing means for biasing one
3 of said parts relative to the other of said parts, said

4 energy storing means comprising one of a spiral and a
5 helix.

1 60. (currently amended) The apparatus of claim 1,
2 wherein said helix cooperates with said tracking device
3 to move one of said first and second parts axially in
4 response to turning of said one part, said helix being
5 prestressed and being affixed to said first and second
6 parts, said tracking device dividing the convolutions
7 of said helix into said first and second packages of
8 ~~abutting~~ convolutions.

1 61. (original) The apparatus of claim 1, wherein
2 said helix cooperates with said tracking device to move
3 one of said first and second parts axially in response
4 to turning of said one part, and further comprising a
5 plurality of energy storing elements arranged to bias
6 said parts relative to each other, each of said energy
7 storing elements including a leaf spring having a first
8 end portion connected to one of said parts and a second
9 end portion connected to the other of said parts, said
10 leaf springs being spaced apart from each other in a
11 circumferential direction of said helix.

1 62. (original) The apparatus of claim 1,

2 further comprising at least one coil spring arranged
3 to bias one of said parts axially of the other of said
4 parts.

1 63. (original) The apparatus of claim 62, where-
2 in said coil spring has a longitudinal axis and is self-
3 centering in the direction of said longitudinal axis.

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1 64. (original) The apparatus of claim 1, where-
2 in said helix, said turning device and said means for
3 turning are arranged to move one of said parts axially
4 and said helix has an axial profile.

1 65. (original) The apparatus of claim 64,
2 wherein said profile is an at least substantially V-
3 shaped profile.

1 66. (original) The apparatus of claim 65,
2 wherein said profile has a ridge facing counter to the
3 direction of action of said helix.

1 67. (original) The apparatus of claim 1,
2 wherein said turning means cooperates with said helix
3 and with said tracking device to effect an angular dis-
4 placement of said parts relative to each other.

1 68. (original) The apparatus of claim 1,
2 wherein said turning means comprises means for rotating
3 said one part relative to said other part.

1 69. (original) The apparatus of claim 1, fur-
2 ther comprising a housing having a third part which is
3 stationary relative to said one part.

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1 70. (original) The apparatus of claim 1,
2 wherein said one part has an axis and said turning means
3 includes means for rotating said one part about said
4 axis.

1 71. (original) The apparatus of claim 1,
2 wherein said means for turning comprises at least one
3 electric motor.

1 72. (currently amended) The apparatus of claim
2 1, wherein said means for turning comprises a ~~turbine~~;
3 such as a ~~compressed air~~ turbine.

1 73. (original) The apparatus of claim 1,
2 wherein said one part has a first radial dimension and
3 said means for turning has a second radial dimension
4 less than said first dimension.

1 74. (currently amended) The apparatus of claim
2 1, wherein said parts include a radially inner part and
3 a radially outer part, said means for turning being dis-
4 posed within said radially outer part.

1 75. (original) The apparatus of claim 74,
2 wherein said one part is one of said radially inner and
3 radially outer parts.

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1 76. (original) The apparatus of claim 1,
2 wherein said second part is movable to and from at least
3 one end position, and further comprising an abutment
4 arranged to arrest said second part in said at least
5 one end position.

1 77. (original) The apparatus of claim 76,
2 wherein said abutment includes at least one cushion
3 effective in at least one of a plurality of directions
4 including axially and circumferentially of said second
5 part.

1 78. (original) The apparatus of claim 1, fur-
2 ther comprising at least one stop arranged to limit the
3 extent of turnability of said one part relative to said
4 other part.

1 79. (original) The apparatus of claim 78,
2 wherein said means for turning includes an electric
3 motor and said stop forms part of said motor.

1 80. (original) The apparatus of claim 1,
2 further comprising at least one sensor arranged to
3 monitor the extent of axial displacement of one of said
4 parts.

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1 81. (original) The apparatus of claim 80, whe-
2 rein said sensor is an incremental sensor.

1 82. (original) The apparatus of claim 80,
2 wherein said sensor is arranged to monitor the maximum
3 extent of axial movement of one of said parts.

1 83. (original) The apparatus of claim 1,
2 wherein said first part is surrounded by said second
3 part and has a central opening.

1 84. (original) The apparatus of claim 83,
2 further comprising a shaft received in said opening,
3 said means for turning being mounted on said shaft.

1 85. (original) The apparatus of claim 1, whe-

2 rein said one part includes a rotary shaft and said
3 turning means is non-rotatably associated with said
4 shaft, said one part being braked by a stationary
5 housing.

1 86. (original) The apparatus of claim 1,
2 wherein said one part is force-lockingly connectable
3 with a rotary element and said other part is force-lock-
4 ingly connectable with a fixed housing.

1 87. (currently amended) The apparatus of claim
2 1, further comprising a shaft rotatable in a single
3 direction and connected with said one part.

88 and 89 (cancelled)

1 90. (original) The apparatus of claim 1,
2 wherein said means for turning has a central opening
3 and further comprising a shaft extending through said
4 opening and being associated with one of said first and
5 second parts.

1 91. (original) The apparatus of claim 1,
2 wherein said means for turning comprises a rotor and
3 one of said first and second parts is integrated into
4 said rotor.

1 92. (original) The apparatus of claim 91,
2 wherein the other of said first and second parts is
3 integrated into a housing of said means for turning.

1 93. (original) The apparatus of claim 91,
2 further comprising a shaft, said means for turning being
3 rotatably or non-rotatably mounted on said shaft.

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1 94. (original) The apparatus of claim 1,
2 wherein said one part is arranged to act upon an axially
3 movable component at a variable angular speed, and
4 further comprising an antifriction bearing between said
5 one part and said component.

1 95. (original) The apparatus of claim 94,
2 wherein said antifriction bearing is mounted on said
3 one part.

1 96. (original) The apparatus of claim 1, fur-
2 ther comprising first and second machine components,
3 at least one of said first and second parts being
4 arranged to move one of said components relative to the
5 other of said components in at least one of directions
6 including (a) in the direction of an axis of said one
7 component and (b) at least substantially radially of
8 said axis.

97. (cancelled)

1 98. (original) The apparatus of claim 1,
2 further comprising first and second shafts and first
3 and second pulleys non-rotatably mounted on said first
4 and second shafts, respectively, at least one of said
5 pulleys having a variable diameter and at least one of
6 said first and second parts being arranged to vary the
7 diameter of said at least one pulley.

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1 99. (original) The apparatus of claim 98,
2 further comprising a variable-length endless flexible
3 element trained over said pulleys, and means for varying
4 the length of said flexible element.

1 100. (original) The apparatus of claim 1, fur-
2 ther comprising an engageable and disengageable friction
3 clutch having a first rotary shaft coaxial with said
4 parts, first and second pressure plates non-rotatably
5 mounted on said first shaft, one of said pressure plates
6 being movable axially of said shaft and further
7 comprising a second rotary shaft coaxial with said first
8 shaft, a clutch disc between said pressure plates, and
9 adjustable resilient means carried by said second shaft
10 and arranged to bias said one pressure plate against

11 said clutch disc and thus against said other pressure
12 plate, one of said first and second parts being arranged
13 to adjust said resilient means to thus select the extent
14 of engagement of said clutch.

1 101. (original) The apparatus of claim 1,
2 further comprising a combustion engine having an output
3 shaft, a second shaft coaxial with said output shaft,
4 and an engageable and disengageable friction clutch
5 between said shafts, said clutch being coaxial with said
6 parts and including a component movable in the direction
7 of the common axis of said shafts by at least one of
8 said parts to thus change the extent of engagement of
9 said clutch.

1 102. (original) The apparatus of claim 101,
2 wherein said parts are mounted on said second shaft.

1 103. (original) The apparatus of claim 1, fur-
2 ther comprising a first rotary shaft, a prime mover
3 arranged to drive said first shaft about an axis, a
4 split flywheel including a first flywheel mounted on
5 said first shaft, a second flywheel coaxial with and
6 rotatable relative to and jointly with said first
7 flywheel, means for yieldably opposing rotation of at

8 least one of said first and second flywheels relative
9 to the other of said first and second flywheels, a
10 second shaft coaxial with said first shaft, and an
11 engageable and disengageable friction clutch between
12 said second flywheel and said second shaft, one of said
13 parts being arranged to change the extent of engagement
14 of said clutch.

104. (original) The apparatus of claim 1,
further comprising control means for said turning
means.

105. (original) The apparatus of claim 104,
wherein said control means includes at least one sensor
arranged to transmit signals and means for adjusting
said turning means in response to said signals.

106. (original) The apparatus of claim 105,
wherein said at least one sensor is arranged to transmit
signals in response to changes of at least one of a
plurality of parameters including (a) the RPM of a
rotary component, (b) a distance covered by a rotary
component, (c) changes of speed of a rotary component,
(d) a change of force, and (e) at least one further pa-
rameter derivable from at least one of said parameters
(a) to (d).

1 107. (original) The apparatus of claim 1, fur-
2 ther comprising an automated friction clutch for use
3 in a motor vehicle and a control system for said clutch,
4 at least one of said parts being arranged to adjust said
5 clutch in response to signals denoting changes of at
6 least one variable parameter furnished by at least one
7 sensor forming part of said control system and arranged
8 to monitor at least one of (a) the RPM of at least one
9 driven wheel of a motor vehicle embodying said clutch,
10 (b) the RPM of at least one non-driven wheel of the
11 vehicle, (c) the position of the flap of the throttle
12 valve in the engine of the vehicle, (d) the speed of
13 the vehicle, (e) the RPM of the transmission in the
14 vehicle, (f) the RPM of the engine, (g) acceleration of
15 the vehicle, (h) transverse acceleration, (i) signal
16 from wheel blocking means, (j) selected speed ratio of
17 the transmission, (k) the magnitude of torque being
18 transmitted by the clutch, (l) the temperature of the
19 clutch, (m) the temeperature of lubricant in the trans-
20 mission. (n) the temperature of lubricant in the engine,
21 and (o) the angular position of the steering wheel.

1 108. (currently amended) Apparatus for effect-
2 ing relative axial movements, comprising:
3 first and second parts at least one of which is

4 rotatable relative to the other about an axis common
5 to said first and second parts;

6 at least one tracking device fixed relative to
7 said first part as seen in the direction of said axis;

8 a helix non-rotatably associated with said second
9 part and having a plurality of convolutions including
10 first and second packages of neighboring convolutions,
11 each of said packages consisting at least in part of
12 abutting convolutions and said tracking device having
13 a portion extending between at least two of said convo-
14 lutions; and

15 means for rotating said at least one part
16 relative to said other part.

1 109. (currently amended) Apparatus for effect-
2 ing relative radial movements, comprising:

3 first and second parts at least one of which is
4 rotatable relative to the other thereof about a predeter-
5 mined axis;

6 at least one tracking device axially fixed
7 relative to said first part;

8 a helix non-rotatably associated with said second
9 part and having a plurality of convolutions including
10 first and second packages of neighboring convolutions,
11 each of said packages consisting at least in part of

12 abutting convolutions and said tracking device having
13 a portion extending between at least two of said convo-
14 lutions; and
15 means for rotating said at least one part
16 relative to said other part.

110. (cancelled)

111. (re-presented - formerly allowable depend-
ent claim 88) Apparatus for effecting relative move-
ments of first and second parts at least one of which
is turnable relative to the other, comprising:

at least one tracking device fixed relative to
said first part;

a helix non-rotatably associated with said second
part and having a plurality of convolutions, said
tracking device having a portion extending between at
least two of said convolutions; and

means for turning said one part relative to said
other part, said other part being non-rotatably affixed
to a shaft and the one part being braked against a
housing for the purpose of actuating the apparatus in
a first axial direction whereas, for the purpose of ac-
tuating the apparatus in a second axial direction, said
one part being non-rotatably affixed to the shaft and
the other part being braked against the housing.

1 112. (re-presented - formerly allowable depend-
2 ent claim 89) The apparatus of claim 111, wherein at
3 least one of said affixing and said braking is effected
4 by at least one electromagnet and/or by at least one
5 fluid-operated slave cylinder associated with a source
6 of pressurized fluid.

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1 113. (re-presented - formerly allowable depend-
2 ent claim 97) Apparatus for effecting relative move-
3 ments of first and second parts at least one of which
4 is turnable relative to the other, comprising:

5 at least one tracking device fixed relative to
6 said first part;

7 a helix non-rotatably associated with said second
8 part and having a plurality of convolutions, said track-
9 ing device having a portion extending between at least
10 two of said convolutions;

11 means for turning said one part relative to said
12 other part; and

13 a collect chuck arranged to radially clamp
14 workpieces and to receive motion from at least one of
15 said first and second parts.